

## SPECIAL SECTION

## Insights of the Decade

## INTRODUCTION

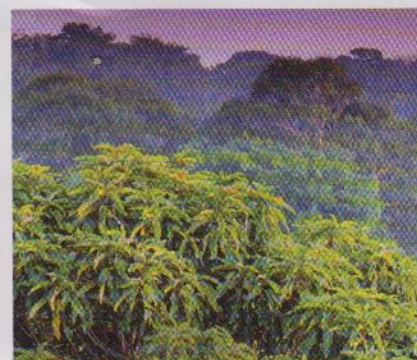
- 1612 Stepping Away From the Trees  
for a Look at the Forest

## INSIGHTS

- 1614 Shining a Light on the  
Genome's 'Dark Matter'
- 1615 A Recipe for the Cosmos
- 1616 Tiny Time Machines Revisit Ancient Life
- 1617 A Roller-Coaster Plunge Into  
Martian Water—and Life?

- 1618 Cells Rewrite Their Own Destiny
- 1619 Body's Hardworking Microbes  
Get Some Overdue Respect
- 1620 Alien Planets Hit the Commodities Market
- 1621 Inflammation Bares a Dark Side
- 1622 Strange New Tricks With Light
- 1623 Climatologists Feel the Heat  
as Science Meets Politics

>> Editorial p. 1587; Science Podcast, Science Careers,  
and Video p. 1581 and [www.sciencemag.org/special/insights2010/](http://www.sciencemag.org/special/insights2010/)



page 1597

## EDITORIAL

- 1587 Is the Frontier Really Endless?  
*Bruce Alberts*  
>> Breakthrough of the Year section p. 1604;  
Insights of the Decade section p. 1612

## NEWS OF THE WEEK

- 1596 NSF Won't Build Underground Lab;  
Scientists Hope That DOE Will
- 1597 Cancún Delegates See the Trees  
Through a Forest of Hot Air
- 1598 Haunted by 'Specter of Unavailability,'  
Experts Huddle Over Critical Materials
- 1599 Asia's Looming Social Challenge:  
Coping With the Elder Boom
- 1599 From the Science Policy Blog
- 1600 Google Opens Books to New  
Cultural Studies  
>> Science Express Research Article  
by J.-B. Michel et al.
- 1601 Leaving Congress, Physicist Bill Foster  
Calls for Reinforcements
- 1602 Genetic Analysis Points the Way  
to Individualized PSA Tests  
>> Sci. Transl. Med. Research Article  
by J. Gudmundsson et al. p. 1581
- 1603 The Top 10 ScienceNOWs of 2010

## NEWS FOCUS

- 1604 Breakthrough of the Year  
The First Quantum Machine  
The Runners-Up  
Diving Into the Oil Spill  
Scorecard  
Areas to Watch  
Whiplash for Stem Cell Researchers  
>> Editorial p. 1587; Readers' Picks p. 1625;  
and online at [www.sciencemag.org/special/insights2010/](http://www.sciencemag.org/special/insights2010/)
- 1610 The Year in News

## LETTERS

- 1625 China's Plan Flawed But Courageous  
*J. Nathans*  
Readers' Picks: Your  
Breakthrough Nominations  
>> Breakthrough of the Year section p. 1604  
Regulating Genetic Tests:  
Account for Benefits  
*S. A. Williams*  
Regulating Genetic Tests:  
Who Owns the Data?  
*A. Baskys*  
Response  
*A. L. McGuire et al.*
- 1627 CORRECTIONS AND CLARIFICATIONS
- 1627 TECHNICAL COMMENT ABSTRACTS

## BOOKS ET AL.

- 1628 Social Networks and Health  
*T. W. Valente, reviewed by J. Adams*
- 1629 iGEM 2010 Jamboree

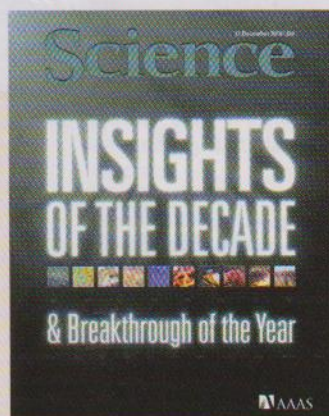
## POLICY FORUM

- 1630 Turning Patent Swords  
into Shares  
*G. Van Overwalle*

## PERSPECTIVES

- 1632 Catalyzing NO to N<sub>2</sub>O in the  
Nitrogen Cycle  
*P. Moënne-Loccoz and J. A. Fee*  
>> Report p. 1666
- 1633 Optical Metamaterials—  
More Bulky and Less Lossy  
*C. M. Soukoulis and M. Wegener*
- 1635 Have You Seen Your Mother, Baby ...  
*A. G. Betz*  
>> Report p. 1695
- 1636 The Burning Issue  
*I. C. Prentice*  
>> Report p. 1663
- 1638 Enforcing the Greatwall in Mitosis  
*D. M. Virshup and P. Kaldis*  
>> Reports pp. 1670 & 1673

CONTENTS continued >>



## COVER

In the first decade of the millennium, rapid progress has transformed whole areas of research (see the Insights of the Decade section on page 1612). Meanwhile, the Breakthrough of the Year goes to the first mechanical devices to reach the quantum ground state, a feat achieved by physicists at the University of California, Santa Barbara (see the Breakthrough section on page 1604). Also see related online content at [www.sciencemag.org/special/insights2010/](http://www.sciencemag.org/special/insights2010/).

Credit: Yael Fitzpatrick and Matthew Twombly/Science

## DEPARTMENTS

- 1583 This Week in Science
- 1588 Editors' Choice
- 1592 Science Staff
- 1595 Random Samples
- 1700 New Products
- 1701 Science Careers



- 1639 Being Glassy Without Being Hard to Solve  
F. Ricci-Tersenghi

- 1641 Retrospective: Britton Chance (1913–2010)  
P. L. Dutton

## REPORTS

- 1642 A Giant Planet Around a Metal-Poor Star of Extragalactic Origin  
J. Setiawan et al.

A planet is observed to orbit a star whose properties are different from those of all other known planet-hosting stars.

- 1645 Experimental Spin Ratchet

M. V. Costache and S. O. Valenzuela

A superconducting-based single-electron device is used to control the flow of electronic spin currents.

- 1648 Spin Transfer Torques in MnSi at Ultralow Current Densities

F. Jonietz et al.

A complicated spin texture lattice in a bulk material rotates under the influence of a tiny electrical current.

- 1652 Electronic Spin Storage in an Electrically Readable Nuclear Spin Memory with a Lifetime >100 Seconds

D. R. McCamey et al.

An electrically readable spin memory in silicon has been developed with storage times exceeding 100 seconds.

- 1656 Oxygen Doping Modifies Near-Infrared Band Gaps in Fluorescent Single-Walled Carbon Nanotubes

S. Ghosh et al.

Contrast can be improved in bioimaging applications by separating the emission and absorption wavelengths.

- 1660 Entropically Stabilized Local Dipole Formation in Lead Chalcogenides

E. S. Božin et al.

Upon heating, lead telluride and lead sulfide show the formation of a less symmetric, dipolar structure.

- 1663 Large Variations in Southern Hemisphere Biomass Burning During the Last 650 Years

Z. Wang et al.

Large variations in the degree of biomass burning in the Southern Hemisphere occurred during the past 650 years.

>> Perspective p. 1636

- 1666 Structural Basis of Biological  $N_2O$  Generation by Bacterial Nitric Oxide Reductase

T. Hino et al.

A structural comparison gives insight into the features that allow conversion between nitric oxide and oxygen reduction.

>> Perspective p. 1632

- 1670 Greatwall Phosphorylates an Inhibitor of Protein Phosphatase 2A That Is Essential for Mitosis

S. Mochida et al.

An inhibitor of protein phosphatase 2A is identified as a component of the machinery controlling cell division.

- 1673 The Substrate of Greatwall Kinase, Arpp19, Controls Mitosis by Inhibiting Protein Phosphatase 2A

A. Gharbi-Ayachi et al.

The protein kinase Greatwall controls cell division by phosphorylating and activating an inhibitor of protein phosphatase 2A.

>> Perspective p. 1638

- 1677 Cholinergic Interneurons Control Local Circuit Activity and Cocaine Conditioning

I. B. Witten et al.

Silencing giant interneurons and thereby exciting medium spiny neurons during cocaine-induced activity disrupts cocaine reward.

- 1682 New Genes in *Drosophila* Quickly Become Essential

S. Chen et al.

One-third of evolutionary young genes is essential to fruit flies.

- 1685 Cytoplasmic Partitioning of P Granule Components Is Not Required to Specify the Germline in *C. elegans*

C. M. Gallo et al.

Germ granules do not need to be segregated asymmetrically during cell division to specify germ cell fate.

- 1689 Glucose and Weight Control in Mice with a Designed Ghrelin O-Acyltransferase Inhibitor

B. P. Barnett et al.

A drug inhibiting the activation of ghrelin, a peptide that promotes weight gain, has beneficial metabolic effects in mice.

- 1693 The Cellular and Physiological Mechanism of Wing-Body Scaling in *Manduca sexta*

H. F. Nijhout and L. W. Grunert

The central nervous system and the hormone ecdysone govern wing-size scaling in the tobacco hornworm.

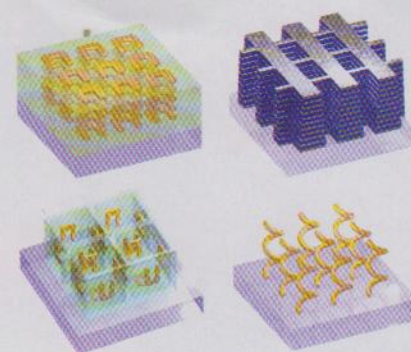
- 1695 Fetal and Adult Hematopoietic Stem Cells Give Rise to Distinct T Cell Lineages in Humans

J. E. Mold et al.

Distinct fetal T cell lineages help explain the tolerogenic properties of the fetus and immune responsiveness at birth.

>> Perspective p. 1635

CONTENTS continued >>



page 1633



pages 1636 & 1663



page 1682